

CLAIMS

1. A power saving control method for use on a computer

5 system, comprising the steps of:

checking an operation state of the computer system;

switching the computer system from a normal operation mode to a first power saving mode when the computer system enters a first operation state;

10 switching the computer system from the normal operation mode to a second power saving operation mode when the computer system enters a second operation state, said second power saving operation mode differing in power saving effect from the first power saving operation mode; and

15 returning the computer system from the first or the second
power saving operation mode to the normal operation mode
according to a predetermined return condition.

2. A power saving control method for use on a computer

20 system, comprising the steps of:

checking if any timer-expiration-waiting event is present in an event queue, which manages event-waiting tasks, when there is no executable user task and therefore a CPU has entered an idle state;

25 switching the computer system to a first power saving
operation mode when there is any timer-expiration-waiting event
in the event queue, said first power saving operation mode

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stopping a CPU operation clock while allowing a timer interrupt to be accepted;

switching the computer system to a second power saving operation mode when there is no timer-expiration-waiting event

5 in the event queue, said second power saving operation mode disabling the timer interrupt while stopping the CPU operation clock;

saving the time of a hardware timer when entering the second power saving operation mode;

10 returning the computer system from the first or the second power saving operation mode to a normal operation mode in response to an occurrence of an interrupt; and

detecting the time of the hardware timer when the computer system returns from the second power saving operation mode to
15 the normal operation mode, calculating an elapsed time from the saved time, and correcting a timer value of a software timer based on the elapsed time.

3. A computer system comprising a CPU having a real-time
20 operating system, wherein

said real-time operating system comprises:

an execution queue that manages a queue of execution waiting tasks;

an event queue that manages event waiting tasks;

25 a power saving transition check module that checks if there is any timer-expiration-waiting event in the event queue when there is no executable user task in the execution queue and

therefore a CPU has entered an idle state and, depending upon whether or not there is any timer-expiration-waiting event in the event queue, switches the computer system from a normal operation mode to a first power saving operation mode or to a 5 second power saving operation mode that has a power saving effect different from that of the first power saving operation mode; and

a power saving mode release module that returns the computer system from the first or the second power saving 10 operation mode to the normal operation mode according to a predetermined return condition.

4. The computer system according to claim 3,
wherein, when there is no executable user task and
15 therefore the CPU has entered the idle state, said power saving transition check module switches the computer system to the first power saving operation mode when there is any timer-expiration-waiting event in the event queue , said first power saving operation mode stopping a CPU operation clock while
20 allowing a timer interrupt to be accepted,

switches the computer system to the second power saving operation mode when there is no timer-expiration-waiting event in the event queue, said second power saving operation mode disabling the timer interrupt while stopping the CPU operation 25 clock and, at the same time saves the time of a hardware timer, and

wherein said power saving mode release module returns the

computer system from the first or the second power saving operation mode to the normal operation mode in response to an occurrence of an interrupt, detects the time of the hardware timer, calculates an elapsed time from the saved time, and

5 corrects a timer value of a software timer based on the elapsed time.

5. A recording medium storing thereon a computer readable program that causes a computer system to:

10 check if any timer-expiration-waiting event is present in an event queue, which manages event-waiting tasks, when there is no executable user task and therefore a CPU has entered an idle state;

15 switch the computer system to a first power saving operation mode when there is any timer-expiration-waiting event in the event queue , said first power saving operation mode stopping a CPU operation clock while allowing a timer interrupt to be accepted;

20 switch the computer system to a second power saving operation mode when there is no timer-expiration-waiting event in the event queue, said second power saving operation mode disabling the timer interrupt while stopping the CPU operation clock;

25 save the time of a hardware timer when entering the second power saving operation mode;

return a computer system from the first or the second power saving operation mode to a normal operation mode in response to

an occurrence of an interrupt; and detect the time of the hardware timer, when the computer system returns from the second power saving operation mode to the normal operation mode, calculate an elapsed time from the saved time, and correct a 5 timer value of a software timer based on the elapsed time.

6. A microprocessor having a function of a real-time operating system, wherein

10 said real-time operating system comprises:

10 an execution queue that manages a queue of execution waiting tasks;

15 an event queue that manages event waiting tasks;

15 a power saving transition check module that checks if there is any timer-expiration-waiting event in the event queue when

20 there is no executable user task in the execution queue and therefore a CPU has entered an idle state and, depending upon whether or not there is any timer-expiration-waiting event in the event queue , switches the microprocessor from a normal operation mode to a first power saving operation mode or to a 20 second power saving operation mode that has a power saving effect different from that of the first power saving operation mode; and

25 a power saving mode release module that returns the computer system from the first or the second power saving 25 operation mode to the normal operation mode according to a predetermined return condition.

7. A computer program that causes a computer system to:

check if any timer-expiration-waiting event is present in an event queue, which manages event-waiting tasks, when there is no executable user task and therefore a CPU has entered an idle state;

switch the computer system to a first power saving operation mode when there is any timer-expiration-waiting event in the event queue , said first power saving operation mode stopping a CPU operation clock while allowing a timer interrupt to be accepted;

switch the computer system to a second power saving operation mode when there is no timer-expiration-waiting event in the event queue, said second power saving operation mode disabling the timer interrupt while stopping the CPU operation clock;

save the time of a hardware timer when entering the second power saving operation mode;

return the computer system from the first or the second power saving operation mode to a normal operation mode in response to an occurrence of an interrupt; and

detect the time of the hardware timer, when the computer system returns from the second power saving operation mode to the normal operation mode, calculate an elapsed time from the saved time, and correct a timer value of a software timer based on the elapsed time.